I (WE) CLAIM:

1. A method for computing spatial derivatives for medical imaging, the method comprising:

(a) determining a spatial gradient vector in an acoustic domain for at least one ultrasound data sample; and

(b) transforming the spatial gradient vector to a Cartesian coordinate system.

2. The method of Claim 1 further comprising:

(c) volume rendering ultrasound data, including the at least one ultrasound data sample, as a function of the transformed spatial gradient vector from (b).

3. The method of Claim 2 wherein (c) comprises volume rendering with shading, the shading being a function of the transformed spatial gradient vector.

4. The method of Claim 1 further comprising:

(c) generating a two dimensional image from ultrasound data, including the at least one ultrasound data sample, as a function of the transformed spatial gradient vector from (b).

5. The method of Claim 1 further comprising:

(c) filtering ultrasound data, including the at least one ultrasound data sample, as a function of the transformed spatial gradient vector from (b), the filtering operable to perform at least one of: speckle reduction, feature enhancement and edge enhancement.

6. The method of Claim 1 wherein (a) comprises calculating a derivative of ultrasound data associated with the at least one ultrasound data sample, the derivative along one of: azimuth angle, range and elevation angle.

7. The method of Claim 6 wherein (a) comprises calculating a derivative of the order at least one as a function of azimuth angle and a second derivative as a function of range.

8. The method of Claim 1 wherein (b) comprises weighting the spatial gradient vector of the acoustic domain as a function of a relationship of an acoustic grid to the Cartesian coordinate system.

9. The method of Claim 1 wherein (b) comprises calculating two spatial derivatives in the Cartesian coordinate system as a function of multiplying at least two spatial gradient vectors in the acoustic domain by a matrix.

10. The method of Claim 9 wherein (b) comprises using a matrix representing spatial differences between the acoustic domain and the Cartesian coordinate system.

11. The method of Claim 1 further comprising:

(c) performing (b) with one of a programmable fragment shader, a vertex shader and combinations thereof of a graphics processing unit.

12. The method of Claim 1 further comprising:

(c) generating a three-dimensional representation from ultrasound data, including the at least one ultrasound data sample, in the acoustic domain without scan conversion of ultrasound data representing two-dimensional regions.

13. In a method for computing spatial derivatives for medical ultrasound imaging, the improvement comprising:

(a) calculating a spatial gradient vector representing a gradient in a Cartesian coordinate space from ultrasound data in the acoustic domain, the ultrasound data being free of scan conversion.

14. A system for computing spatial derivatives for medical ultrasound imaging, the system comprising:

a receive beamformer operable to output ultrasound data in an acoustic domain;

a graphic processor unit connected with the receive beamformer, the graphics processor unit operable to determining a spatial gradient vector in the acoustic domain from the ultrasound data and operable to transform the spatial gradient vector to a Cartesian coordinate system.

15. A method for computing spatial derivatives for medical ultrasound imaging, the method comprising:

(a) resampling ultrasound data in an acoustic domain to ray-lines representing a viewing angle through a volume; and

(b) determining gradient information from the resampled ultrasound data.

16. The method of Claim 15 further comprising:

(c) determining values along the ray-lines as a function of the resampled ultrasound data and the gradient information; and

(d) blending along the ray-lines with the values of (c).

17. The method of Claim 15 further comprising:

(c) delaying resampled ultrasound data from adjacent ray-lines;

wherein (b) comprises determining the gradient information from the delayed resampled ultrasound data.

18. The method of Claim 15 wherein (b) comprises determining first and second gradients along first, second and third dimensions.

19. The method of Claim 15 further comprising:

(c) shading the resampled ultrasound data as a function of the gradient information.

20. The method of Claim 15 wherein (b) comprises determining gradients from ultrasound data in a screen domain, the ultrasound data in the screen domain being a two dimensional representation of a three dimensional volume;

further comprising:

(c) shading the ultrasound data as a function of the gradients.

21. A method for computing spatial derivatives for medical ultrasound imaging, the method comprising:

(a) shading ultrasound data representing a three dimensional volume; and

(b) resampling the shaded ultrasound data to ray-lines representing a viewing angle through the three dimensional volume.

22. The method of Claim 21 further comprising:

(c) blending the shaded, resampled ultrasound data along the ray-lines.

23. The method of Claim 21 wherein (a) comprises shading one of: display intensities with opacity weights and display intensities with transparency weights.

24. The method of Claim 21 wherein (a) comprises shading ultrasound data in an acoustic domain and free of two-dimensional scan conversion.

25. The method of Claim 21 further comprising:

(c) determining gradients for the ultrasound data;

wherein (a) comprises altering the ultrasound data as a function of the gradients.

26. The method of Claim 1 further comprising:

(c) performing (b) with a programmable vertex shader of a graphics processing unit.

27. The method of Claim 1 further comprising:

(c) performing (b) with programmable vertex and fragment shaders of a graphics processing unit.